AQUATIC CONSERVATION STRATEGY (ACS)

In this section, we will address how BLM management activities inside the South Fork Coos Watershed and the attainment of the Aquatic Conservation Strategy (ACS) objectives. The ACS objectives (USDA-USDI 1994, pg. B-11) guide those federal land managers charged with carrying out the Northwest Forest Plan on protecting and managing the landscape processes necessary for riparian and aquatic habitat development. By maintaining the physical processes, the terrestrial and aquatic biota are provided for as well. The ACS objectives are to manage for: 1) distribution, diversity and complexity of landscape-scale features, 2) spatial and temporal connectivity within and between watersheds, 3) physical integrity of the aquatic system, 4) water quality, 5) the sediment regime, 6) in-streamflows, 7) flood plain inundation and water table elevation, 8) species composition and structural diversity of plant communities, and 9) habitat to support riparian-dependent plant and animal species. Land management activities that incorporate these components would lead to improved habitat conditions over time.

Current Conditions

Age Class Distribution and its Effect on Management Options: Age classes of forested stands have a direct bearing on management options in the Watershed. Young stands, generally less than 5-years old but in some instances up to 10 or 15 years, are considered unestablished because they are at risk of animal damage, vegetation competition or other conditions that cause tree mortality. The risk associated with inaction range from reduced height and diameter growth to lost of most or all the conifer component of the stand resulting in a conversion of the site to an alder stand or a brushfield. On Matrix land, this can reduce the volume available for future harvest. On the reserve lands, this delays the attainment of late-successional attributes that are directly or indirectly derived from large conifers.

Established stands about 10 years old, but sometimes as young as 8 or as old as 20 years, may require precommercial thinning to reduce stocking densities and by that concentrate diameter growth on the residual trees. On Matrix stands, this makes a future commercial thinning entry feasible at an earlier age, and within a relatively narrow range of precommercial thinning spacings, increases the value and volume of the wood produced during the rotation. On reserve lands, precommercial thinning also increases the diameter growth on the leave trees allowing attainment of larger average green tree, CWD and snags sooner than if the stand was left untreated. Depending on the site needs precommercial thinning in reserve stands can be designed to species composition. The precommercial thinning spacing options for reserve lands are not constrained by the need optimize volume production to meet economic objectives. Therefore wider thinning spacings may be used to more closely approximate the diameter growth rates exhibited by trees that survived to become old-growth.

Regeneration cuts on GFMA land are scheduled to assure that over time, stands are harvested at or above the age of volume growth culmination. On the Coos Bay District, culmination occurs between the ages of 60 and 80 years. It can occur earlier on the higher sites and can be delayed by well-designed commercial thinning. Under the Forest Plan, regeneration harvests are intended to provide economic benefits and to provide habitat for those species that either require or benefit from early and/or mid seral habitat (FEMAT 1993; USDA & USDI 1994; USDI 1995). Table ACS-1 is a summary of the current age class distribution of forested stands for the Watershed. ACS Appendix-A contains an expanded summary of BLM forest age classes *by drainage*. The timing of commercial thinnings, and density management are covered in the potential harvest activities subsection later in this chapter.

Table ACS-1: BLM Acres by Land Use Allocation and Age Class in the South Fork Coos Watershed in 1997

Age Class in 1997 (Years)	Land Use Allocation acres minus the Interim Riparian Reserve acres			Administrative withdraws and Interim Riparian Reserve acres within other land use allocation blocks				total all BLM acres	percent of BLM land (percent of 32,675 ac)
	GFMA*	Connectivity*	LSR**	inside GFMA	inside Connectivity	inside LSR**	total admin. w/d plus RR		
nonforest	7	0	106	114	38	283	435	548	1.7%
1-9	294	189	602	529	139	659	1,327	2,412	7.4%
10-19	269	171	846	868	343	1,729	2,940	4,226	12.9%
20-29	203	36	898	736	54	1,859	2,649	3,786	11.6%
30-39	473	54	648	1,242	95	805	2,142	3,317	10.2%
40-49	275	0	461	513	9	1,278	1,800	2,536	7.8%
50-59	100	9	110	136	3	252	391	610	1.9%
60-69	237	53	170	241	47	357	645	1,105	3.4%
70-79	52	18	179	160	45	325	530	779	2.4%
80+	327	373	4,256	809	1,128	6,463	8,400	13,356	40.9%
Total acres	2,237	903	8,276	5,348	1,901	14,010	21,259	32,675	
% acres	6.8%	2.8%	25.3%	16.4%	5.8%	42.9%	65.1%		100.0%
Stands 1 to 29 years old:									
acres	945	261	2,392	2,846	492	4,393	7,731	11,329	
percent	2.9%	0.8%	7.3%	8.7%	1.5%	13.4%	23.7%		34.7%
Stands 30 to 59 years old:									
acres	848	63	1,219	1,891	107	2,335	4,333	6,463	
percent	2.6%	0.2%	3.7%	5.8%	0.3%	7.1%	13.3%		19.8%
Stands 60 to 79 years old:									
acres	289	71	349	401	92	682	1,175	1,884	
percent	0.9%	0.2%	1.1%	1.2%	0.3%	2.1%	3.6%		5.8%
Stands 80 years old and older:									
acres	327	373	4,256	809	1,128	6,463	8,400	13,356	
percent	1.0%	1.1%	13.0%	2.5%	3.5%	19.8%	25.7%		40.9%

* Does not include acres in buffers around known sites of survey and manage species or marbled murrelets
** Acres of LSR and Riparian Reserves inside the LSR include Northern Spotted Owl 100-acre core areas mapped in the GFMA and Connectivity since 1995. Administrative withdraw acres were not broken out of the LSR acres

<u>Roads:</u> The BLM controls 185 miles of road (Map ACS-1) with an average density of 3.6 miles per square mile. Table ACS-2 is a summary by subwatershed of road miles and densities for BLM roads in the Watershed. Road mileage for private land owners is unavailable.

Table ACS-2: Total mileage, densities and location of BLM roads within the South Fork Coos Watershed.

Drainage	BLM Road Miles	BLM Road Density (mi./mi.^{2})
Panther Creek Subwatershed	9.1	3.4
Cedar Creek Subwatershed	17.0	3.1
Tioga Creek Subwatershed	84.9	3.4
South Coos Subwatershed	73.7	4.0
Total BLM Road Miles= 185 Total BLM Road Density= 3.6		

Roads within the Riparian Reserves can alter the delivery of coarse woody debris (CWD) and substrate to the stream network. Stream side roads can constrict the channels. The road fills and undersized stream crossing structures function as dams that constrict flow through a single outlet and prevent the transportation of large material down the channel and eliminate the function of the flood plain. This is especially true during large storms. Surface runoff can also contribute fine sediment to the streams if it is not first routed off into the forest vegetation. Roads that cross streams, roads connected to streams via the ditch line, and roads that closely parallel streams present the greatest risk for contributing fine sediment to stream. Upper slope and ridge top roads that are not connected to streams present the least risk. The Erosion Process Chapter addresses the interaction of roads and erosional processes and their influence on streams. Table ACS-3 shows the percent of roads by slope position in those drainages with significant acres of BLM land.

Table ACS-3: Total Road Miles, Densities and Percent of Roads by Slope Position by Drainage

Drainage	Road Miles	Road Density (miles/square mile)	Percent of Roads by Location		
			Stream Bottom	Mid Slope	Ridge Top
Burnt	19.5	4.2	1.5%	19.5%	79.0%
Coal	20.0	4.9	8.5%	12.5%	79.0%
Cox	11.0	3.9	18%	23.6%	58.4%
Daniels	86.6	5.5	14.8%	12.7%	72.5%
Lower Tioga	72.0	5.1	11.1%	4.2%	84.7%
Middle Tioga	25.7	2.3	36.6%	11.7%	51.7%
Mink	22.0	4.7	0%	16.8%	83.2%
South Fork Coos	56.0	3.6	16.1%	29.8%	54.1%
Upper Tioga	39.7	4.5	1.5%	7.6%	90.9%

Asphalt and gravel roads contribute very little sediment to streams as their surfaces are composed of solid and/or stable compacted material. Natural (dirt) surfaced roads, subject to moderate or heavy traffic, are easily eroded and can contribute sediment to streams if proper drainage is not installed[1]. Table ACS-4 shows roads inside the Riparian Reserve by surface type. Road control and surface type are shown on Map ACS-1.

Table ACS-4: Miles of BLM Roads Within Riparian Reserves by Surface Type and Subwatershed.

Surface Type	Panther Ck.	Cedar Ck.	Tioga Ck.	South Coos	Total
Asphalt	0.5	0.2	7.0	5.5	13.2
Gravel	2.5	2.8	25.5	16.9	47.7
Natural (dirt)	0.1	1.5	2.3	1.9	5.8
Total	3.1	4.5	34.8	24.3	66.7

<u>Landslides:</u> see Erosion Section

[1] The Upper Middle Umpqua Watershed Analysis (USDI 1997) includes an analysis of the affect road surface type and use on sediment delivery that is generally applicable to all roads in the Umpqua Resource Area.

Restoration Activities
Passive Restoration: Ninety percent of BLM lands in the Watershed, 29,535 acres, are in either LSR or Riparian Reserve land use allocation. The conifer stands and natural hardwood sites on these acres are not available for clearcut harvest under the Forest Plan. Alder stands on conifer sites are available for regeneration harvest if done to restore conifers on conifer sites. The number of acres of alder stands that are likely to be regeneration harvested is not known but likely is less than 1,000 acres in this Watershed[2]. Based on that assumption, at least 28,535 acres will prove the passive restoration benefits associated with a continuous forest cover. That represents 87% of BLM land in the Watershed. The LSR and Riparian Reserves are managed for late-successional/ old-growth habitat, and for protection of hydrologic function and aquatic habitats respectively.

This Watershed includes 10,719 acres of 80-year old and older stands on LSR land. This represents 33% of the BLM land in the Watershed. We are not planning to apply density management treatments to LSR stands older that 80-years. This is consistent with the LSR Assessment recommendations (USDI; USDA 1998). Proposed actions in an LSR not covered by the LSR Assessment would need to be justified based on site needs, and reviewed and approved by REO. Since implementation of the Forest Plan in 1994, active manipulation of stream side stands on the Umpqua Resource Area, which are older than 80-years, has been limited to cutting and line pulling trees to restore large CWD to those streams.

Areas in many stands that could benefit from a density management treatment will not be thinned or will only be lightly treated because we will use no-cut buffers to protect known sites occupied by certain survey and manage, and T&E species. We also will use a combination of no-treatment and light-treatment zones along streams, as needed, to assure near term attainment of some Riparian Reserve functions.

The rate at which we attain restored conditions through passive management depends on the function considered. Table ACS-5 contains estimates of when we will attain recovery of various Riparian Reserve functions and the basis for those estimates.

[2] Based on an analysis of 1993 Lansat data, the Riparian Reserve contains 1,908 acres of hardwoods. Of this, 1,255 acres are in stands 2 acres in size and larger and 819 acres are in stands 5 acres or larger. Operational considerations will result in most alder conversion work occurring in stands that are 5 acres or larger, few if any in stands 2 acres or smaller will be targeted for conversion using a regeneration cut. Conversions of alder stands between 2 to 5 acres generally will be limited to entries associated with other projects. A portion of these hardwood acres are in myrtle and big-leaf-maple stands. The myrtle and maple stands will not be converted to conifer but rather will be retained for habitat and landscape diversity purposes.

Table ACS-5: Estimated Recovery Rates of Riparian Reserves with Regards to Function Assuming Passive Restoration (No Active Management to Shorten Recovery Time)

Riparian Reserve Function	Condition	Estimated Recovery Rate and Supporting Notes
slope stability/ sediment delivery	Increased landslide risk associated with loss of root strength following clearcutting Highest risk sites are characterized by shallow soils on steep slopes.	Increased risk of landsliding occurs during the 10 to 15 years following clearcutting (Swanson et al 1977). Coast Range data indicates the greatest risk of in-unit landsliding occurs in first 3 years following clearcutting (Gresswell et al 1976). Peak risk period (first 3 years after cutting) has passed. Root strength will recover to preharvest levels in about 15 years. We expect full passive recovery of slope stability, as controlled by root strength, between the years 2009 and 2014 for all BLM lands in the LSR and RR. Shallow rapid type landslides are unlikely on land with deep soils on slopes that are less than the angle of repose.
shade	Harvesting to the stream edge exposes the stream to solar heating	Stream width controls the rate of passive recovery. Ten years after clearcutting, vegetation regrowth along Coast Range streams that are less than 10-feet wide (generally 1st, 2nd, and 3rd order streams) will provide shade levels equal to that in mature stands (Summers 1982 cited in Skaugset 1992). Therefore, full passive recovery for small streams inside BLM clearcut units will occur about year 2004. During the 1970's hardwood buffers and hardwood-cedar-hemlock buffers were left next to fish bearing streams following clearcutting on BLM land. Beginning in the early 1980's, BLM timber sales units next to all 3rd order and larger streams, and next to fish bearing 2nd order streams included no-cut stream buffers. These buffers were 80-feet and wider on either side of the stream. These buffers provide passive restoration, with respect to shade on those streams (Brazier; Brown 1973). Before the 1970's, clearcutting down to the stream edge was a common practice on all streams. The youngest of these 2nd growth stream side stands is about 30-years. A 30-year old Douglas-fir stand on an average site will be 78 feet tall (McArdle 1961; site index calculation in the ACS Appendix-E). Full recovery of vegetation for shade has occurred along those 1st to 5th order streams over the last 30 years. Review of old aerial photographs that show the pre-logged stand condition stream side forests indicates that the 7th order and the larger 6th order streams in the Watershed are too wide to be shaded from above by streamside trees. Those photographs also suggest that channel migration will create canopy gaps above 5th order and smaller 6th order streams (Water Quality Chapter.)
coarse woody debris	Harvesting to the stream edge and aggressive stream cleaning has resulted in a loss of instream structure and a lost potential to recruit new large structure from the stream side stand.	See the cell above for stream buffer history. Without active management, green tree average dbh of 20-inches is attained at stand age 70 to 110-years. Passive recovery of the potential to regularly recruit dead trees that average 20-inches dbh and larger from stream side stands will take approximately 120 to 180 years from the time the stream side stand was regenerated. Recovery rates controlled by initial stand density, uniformity and site quality. The assumptions and analysis are in Density Management and Conversion Treatments and attaining Riparian Reserve Functions section of this document. We expect passive recovery of the potential to regularly recruit large wood, along non-fish bearing 1st and 2nd order streams, to occur between the years 2114 and 2174. We expect passive recovery along fish bearing streams between the years of 2094 and 2154. Large diameter wood is attainable earlier in low stocked sites.
edge effect	Placement of a recent clearcut next to an established stand results in an edge. This in turn causes microclimate changes that reach into the established stand. Given certain site conditions (gentle uniform slopes, little understory, favorable aspect), wind can penetrate into an old-growth stand for a distance equal to 3 tree heights. Chen (1991) found edge influences on biological variables ranged from essentially none to 450 feet for hemlock seedlings $\leq$10 cm tall.	No new streamside regeneration units will be created under the Forest Plan except where brushfield and hardwood conversions are accomplished to restore Riparian Reserve function. Fire, blowdown or other natural disturbance may also necessitate future regeneration units next to streams. Where we have existing clearcuts, we attain passive recovery from microclimate changes due to edge effect in older stands as the adjacent clearcut reforests and that new stand grows tall enough to shield the gap between the ground and the base of the crowns of the trees in the older stand (Harris 1984). The establishment and growth of understory trees beneath the older trees along the edge also facilitate passive recovery. The time required for a young plantation to grow tall enough to block the gap below the crown of an adjacent stand depends on the size of the gap and the site quality. Assuming a Kings 50-year site index of 126 ft, and assuming the older stand is 192 feet tall, an adjacent plantation will shield the gap below the older stand's crown in 47-years if the older stand has a 40% crown depth and in 23-years if the older stand has a 70% crown depth (the analysis is in the Density Management and Conversion Treatments and attaining Riparian Reserve Functions section of this document). We expect passive recovery with respect to microclimate edge effect associated with past clearcutting about year 2038 to 2048.

Active Restoration: Table ACS-6 shows the active restoration projects begun in the Watershed since 1987.

Table ACS-6: Completed active restoration projects within the South Fork Coos Watershed.

Project Type	Ownership	Total Treatment Area	Miles of Habitat Affected	Subwatershed
Instream Work				
boulder weirs, cover structures added channel reconstruction	BLM Private/ Ws. Assoc. WA/BLM	0.6 1.0 0.2	1.0 0.7 0.2	 Cedar, S.F.Coos S.F. Coos
Riparian Work				
-planting	Private- Agriculture	4 landowners, area unknown		S.F.Coos
- bank stabilization	Private- Agriculture	1 landowner, area unknown		S.F.Coos
Culvert Work				
- replaced for fish passage - ditchline culverts replaced	BLM County/Pvt.	4 culverts 2 culverts	7 10	Tioga, S.F.Coos S.F.Coos
Road Work				
- closures * (blocked)	BLM	road miles	10.53	Tioga Creek only

* blocked roads are primarily ridgetop roads/spurs with no stream crossings

The Passive/ Active Roles of Density Management: Density management affords a means to do both active management (speed or assure attainment of late-successional stand attributes and large trees that are suitable for recruitment as large riparian/instream structures), and provide passive restoration through maintenance of continuous forest cover (thus assuring the benefits of root strength for streambank and hill slope stability, nutrient cycling, and shade).

Density management treatments applied to younger stands are more effective at setting stands on a trajectory to become old growth, at attaining large stem diameters, for developing wind firmness, and retaining deep crown depths than are late entries. Density management in older stands is more appropriate for attaining a strong size contrast between the overstory and understory trees in a stand, and to tweak the stand thereby recruit attributes like large snags, large down wood, and canopy gaps. Density management for habitat benefits is a relatively young concept. Thus, techniques are evolving, and treatment objectives can change from project to project depending on what we learn from earlier treatments and from the current literature, and on the site specific conditions.

The science behind retaining untreated buffers along streams and other areas of concern to provide passive protection, is rooted in research done in the 1960s and 1970s to protect streams from the impacts that clearcuts had on aquatic/riparian habitats (see the Erosion Processes, Water Quality and the Density Management Chapters for research summaries and citations). Consequently, the underlying science supporting buffers is based on studying the contrast between conditions inside a buffer zone and an adjacent clearcut. We are unaware of any research specifically examining the contrasts between the thinned and unthinned areas within a stand, with respect to identifying adverse treatment impacts that require buffers as mitigation. Instead, the current research efforts focus on how to redirect managed stand growth trajectories to more closely follow the observed trajectory followed by old growth stands, and on how to attain large diameter conifers suitable for recruitment as riparian/instream structure through either stand conversion, release treatment, or thinning. Current research efforts are also exploring how well thinned young stands provide various habitat values when compared with late-successional/ old-growth stands and to unthinned young stands (the Density Management Chapter contains research summaries and citations). This implies researchers and those that fund research see the information needs supporting long term restoration of streamside stand structure and diversity as a more critical data gap.

A review of literature concerning buffers, and an analysis of a range of treatments that we may apply next to streams, suggests a light treatment area equal in width to half the height of the dominant trees in the current stand will insure near term attainment of the passive restoration benefits of shade and litter input, and a no treatment buffer equal to about half the average tree crown width will provide stream bank protection via root strength (see the Assessment of Density Management and Attainment of Riparian Reserve Functions section of this document for the literature review and citations). Conversely, this suggests we can use a more aggressive active management, such as wide-spaced thinning prescriptions, in those parts of stands that are farther back from the stream edge. This would allow more rapid attainment of desired late-successional stand conditions in the long term without adversely affecting short term attainment of those streamside functions attainable through passive management. Some sites have slope, topographic shading, aspect, or other physical attributes that shade or otherwise protect streams. On these sites, where physical features protect streams from direct sun, narrower buffers can provide passive protection of other riparian functions. Considering these physical features would allow the flexibility to use active management to restore CWD recruitment potential, species diversity, and structural complexity nearer to the streams on those sites. The supporting analysis is in the Assessment of Density Management and Attainment of Riparian Reserve Functions section of this document.

Thinning/ density management, which are partial cut systems where live trees are retained on the site. These live trees provide a live root mass that binds the soil together and thus these cutting systems do not increase the risk of mass movement on slide prone ground associated with clearcutting. The amount of live root mass, following a partial cut, is greater than would be indicated by the number of live trees alone. Eis (1972) found 45% of the selectively cut Douglas-firs were root grafted and half those stumps were still alive 22 years later. In addition, the roots of different trees in the stand are intertwined, unlike the tree crowns, which are spatially distinct. Consequently, thinning does not kill all the roots in the discrete areas of soil below the cut trees (Stout 1956 cited in Oliver & Larson 1990).

<u>Effects of "no-action alternatives" and "wide no-treatment buffers"on Attainment of ACS Objectives</u> - The Douglas-fir old-growth forest, along with its associated aquatic habitats are disturbance dependent ecosystems (Agee 1981, Reeves *et al*. 1995.) The optimal conditions for the development of late-successional/ old-growth habitats include disturbances that cause short term detrimental impacts on habitat attributes used by individual species. Consequently, maximizing attainment of individual habitat attributes by excluding or avoiding disturbance can delay attainment of overall late-successional/ old-growth conditions for decades to a century or more. In other terms, selecting the "no-action alternative" for a densely stocked stand would have a "likely to adversely affect" on species that benefit from late-successional forest conditions.

Density management can be used to emulate low to moderate severity natural disturbances without the associated risk of stand replacement that accompanies wildfire. Avoiding the risk of stand replacement fire is particularly important on landscapes where uncontrolled fire poses a risk to both the remaining old-growth patches on BLM land and to adjacent private property values. Density management effects are highly controllable, allowing managers to target those parts of the landscape that can best benefit from treatment. Managers can also selectively moderate treatment intensity or leave some areas untreated, and by that moderate or avoid short term impacts to particularly sensitive areas. This allows attainment of several objectives across a stand that would be mutually exclusive at the acre scale. The problem for biologists designing density management projects is deciding where in the stand to apply the different intensities of treatment in order to avoid short term risks to sensitive areas and still attain the long term objectives. A decision to use a no-treatment buffer around sensitive areas may to be prudent in light of short term effects, and using an extra wide buffer seem good insurance. However, wider that necessary no-treatment buffers do not provide additional short term protection, and carry the cost of delaying attainment of those stand conditions associated with late-successional forest that benefit aquatic systems.

The following describes one example of the tradeoff between short term protection of a habitat attribute and long-term restoration of an ecosystem: Overhead shading of the streams by streamside vegetation is desirable for maintaining the aquatic habitat attribute of cool water temperatures. Maximum shading, resulting in the lowest possible solar heating of streams, occurs during the stem exclusion stage of stand development. Stands do not develop many of the attributes of old-growth, like deep multilayered, multi-aged, multi-species canopies, until after the stands emerge from the stem exclusion stage and enter the understory reinitiation stage. The understory reinitiation stage is heralded by the formation of canopy gaps that allow enough light to reach the forest floor to support survival and growth of understory trees shrubs and herbs (Oliver; Larson 1990). The longer the stand remains in the stem exclusion stage, the later the stand will develop late-successional attributes. The stem exclusion stage is also a period of intense competition, which slows tree diameter growth rates. Work by Tappeiner and coauthors (1997) suggests the Coast Range stands that survived to become old-growth grew under low stocked conditions when young. Low stocking levels allowed those stands to accrue much of their diameter growth when young. That suggests maintaining high stocking levels causes the current stands to develop along a different trajectory than did the stands that survived to become old-growth under unmanaged conditions. These more open growing conditions probably allowed for earlier recruitment of understory vegetation, and development of deeper crowns associated with old-growth than would be possible for the current will-stocked and overstocked stands if those stands were left to develop without either thinning or moderate severity natural disturbance.

If we were to ignore effects of managing for habitat attributes at the expense of restoring ecosystem processes, we would still have situations where maximizing the attainment of one desired habitat attribute can delay attainment of other desired habitat attributes. Returning to the example above, managing for the lowest possible solar heating of streams by retaining high streamside stocking levels in streamside stands to can delay attainment of large average diameter streamside trees. This in turn delays regular attainment of another habitat element, the large instream key pieces of wood. How big an impact this is depends in large part on the width of the no-treatment area. Based on work by McDade and coauthors (1990), 11% of all debris found in streams originated within 1-meter (~3-feet) of the stream and was likely recruited by streambank erosion undermining and toppling trees. Wood originating from more than 1-meter away from the stream was likely delivered to stream by windthrow or other processes unrelated to stream bank erosion. More than 83% of the hardwood pieces and 53% of the conifer pieces originated within 10-meters (33-feet) of the stream. More than 70% of all instream debris originated within 20-meters (66-feet), and 85% would come from within 30-meters (98-feet)of the stream. The probability that a tree will fall into a stream decreases with increasing distance from the stream. This data indicates a 100-foot no-treatment buffer on streams would only allow about 15% of the trees that will eventually contribute wood to a stream to benefit from the additional growing space provided by the density management treatment. With a 66-foot no-treatment buffer, only 30% of the trees that will eventually provide wood to the stream would benefit from the increased growing space provided by the thinning.

The distance that a tree is from a stream will also affect the size of the part of the bole where the tree intersects the stream when the tree falls into the stream. The relation of tree dbh to the diameter of the CWD entering the stream, assuming the fallen tree does not slide down the slope[3], is shown in Table ACS-7 below.

Table ACS-7: The Bole Diameter in Inches at 16-foot Intervals up the Tree for the Average Tree in Each DBH Class
- Bole diameters below the heavy line are ≥20-inches.
- Data is based on log taper and board foot tables for Douglas-fir on Coos Bay District-BLM)

DBH	16 ft.	32 ft.	48 ft.	64 ft.	80 ft.	96 ft.	112 ft.	128 ft.	144 ft.	160 ft.	176 ft.	192 ft.	208 ft.
12 in.	10	9	9	6	5								
16 in.	13	12	11	9	8	5							
20 in.	16	15	14	12	11	9	6						
24 in.	19	18	17	15	14	12	10	7					
28 in.	22	21	19	18	16	13	11	7					
32 in.	24	23	22	20	18	16	14	11	8				
36 in.	29	28	27	25	24	23	20	18	15	12	9		
40 in.	32	31	30	28	27	25	23	21	19	16	13	10	
44 in.	33	32	31	29	28	26	25	23	21	19	16	13	10
48 in.	37	36	34	33	31	29	27	25	23	21	18	15	11

In a project where a 66-foot wide no-thin buffer is used between a stream and the thinned area, the thinned trees adjacent to the buffer will need to be about 28-inches in diameter before they can be expected to deliver 20-inch diameter CWD to the stream based on the information in Table ACS-7 above. In a project where a 98-foot no-thin buffer is used between a stream and the thinned area, the thinned trees adjacent to the buffer will need to be about 36-inches in diameter before they can be expected to deliver 20-inch diameter CWD to the stream.

The following diameter growth data are from stand development simulations used in assessments contained in the Density Management Chapter. They illustrate the time required to grow large diameter trees in thinned and unthinned stands on site II ground:

- Time to obtain 20 and 24-inch average green tree diameters at breast height-
    - Trees in the **thinned** part of the streamside forest will average 20 inches dbh about age 50 to 60-years, and 24 inches dbh about age 70 to 90-years.
    - Trees in an **unthinned** buffer will average 20 inches dbh about age 70-years, and 24 inches about age 120-years on a similar site.
- Time to obtain 20 and 24-inch average diameter dead trees-
    - The **thinned** area will product 20-inch dbh and greater average size dead trees by about age 50 to 80 years, and 24-inch dbh size average dead trees by age 70 to 160 years depending on spacing.
    - An **unthinned** buffer will product 20-inch dbh and greater average size dead trees about age 120-years, and 24-inch dbh by 190 years.

Summary of effects of wide no-treatment buffers on attainment of large wood to streams:

- Diameter growth is slower in the unthinned buffer than in the thinned areas delaying attainment of large diameter wood recruited to streams from the unthinned buffers.

[3] While doing their 1992 study on wind damage to stream buffer strips, Andrus and Froehlich also observed that rootwads, even on very steep ground, rarely slid down hill more than 20 feet (McGreer & Andrus 1992).

- Wide no-treatment buffers reduce the number of trees delivering wood to streams that had benefitted from the growing space provided by the thinning treatment.
- Wide no-thin buffers, delay attainment of large diameter debris produced by the trees in the thinned areas because the desired diameter woody debris has to come from a height on the bole that is directly proportional to the source tree's distance from the stream.

Clearcutting, without retaining a buffer next to streams can raise stream temperature, which stresses fish. However, leaving streamside shrubs and small trees can greatly reduce the stream temperature increases associated with removing all commercial trees next to a stream when compared with temperatures observed following removing all sources of shade from the stream edge by a combination of clearcutting, burning and stream cleaning (Levno and Rothacher 1969 cited in Adam and Ringer 1994). Ten years after clearcutting, vegetation regrowth along Coast Range streams that are less than 10-feet wide will provide shade levels equal to that in mature stands (Summers 1982 cited in Skaugset 1992). Another study showed 50% of a Coast Range stream shaded within 5 years of harvesting and burning (Beschta *et al.* 1987). In contract, a forest canopy is retained following a density management treatment and thus the exposure to sunlight is less than following clearcutting. One near term effect of thinning a stand that is in the stem exclusion stage is to increase the amount of light reaching the forest floor (and potentially streams) from 2 or 3% of full sunlight to light levels that more closely approximate those under a mature stand in the understory reinitiation stage of development. The leave tree crowns will expand to occupy the canopy gaps left by the thinning operation. Following thinning, the period until the canopy gaps are reoccupied by expanding tree crowns above and by an invigorated shrub layer below would be much less than the 10-year recovery time observed following clearcutting next to small streams. The alternative to thinning next to streams, with its short term effects on light levels, is not to thin. Not thinning carries the long term effect of the delay in attainment of large key pieces of durable wood from the untreated areas to the stream. This delay in attainment can be as short as 10 to 20 years if we wait until we have green trees that we can cut or pull over into the stream, or as long as 30 to 40 years if we wait for recruitment of large key pieces through natural mortality.

<u>Effects of Light-treatment Approaches to Restoring Conifers to Hardwood Dominated Stream Side Stands and Attainment of ACS</u> - Emmingham and coauthors (2000) evaluated 34 riparian restoration projects done by the Forest Service and BLM in the Coast Range. The following is from their discussion section:

> [S]*uccessful restoration of conifers* [to streamside stands] *will require an active approach, including marked reduction of competing shrub and overstory trees, at least in patches. The conservative nature of the silvicultural approaches applied in many projects suggest that some managers ignored the high probability of failure without aggressive and effective control of competing vegetation. Our survey of competing vegetation revealed a basic conflict in carrying out the objective of growing large conifers: one-quarter of the projects were at the same time trying to minimize impact on the existing overstory. In addition, we observed that thinnings or creating gaps were done so conservatively that they failed to provide adequate release of existing conifers. The message is clear: It is a waste of time and resources to attempt restoration of conifers in areas where other resource values will preclude an aggressive approach to establishing conifer dominance. Since conifer restoration can be applied in patches, such conflicts should be easy to avoid.*
>
> *Unfortunately, the growing conditions provided by the conservative treatments applied in many restoration projects will not lead to development of large conifer trees [dbh 60 cm (>2 ft)] in the 21st century. Most of the conifers will not survive the combination of poor growing conditions and animal damage. Active management of both overstory and understory to give conifers plenty of growing space is the only way to promote conifers into a dominant (free-to-grow) position.*

The potential conflict between protecting streams from the near term effect of direct sunlight heating streams and obtaining large trees that can supply large durable wood to the stream is greater for hardwood conversion projects than for density management. This conflict stems from the biological necessity for green plants, like conifers, to receive a threshold level of sunlight just to survive, and a need for much higher light levels to fulfill all respiration and growth needs. As noted in the discussion on density management above, the wider the no-treatment buffer between a conversion project and the stream, the longer time needed before the conifers in the converted area can deliver large diameter wood to the stream. One approach to developing an effective hardwood conversion project includes:

- Use the narrowest streamside buffer consistent with providing shade in the near term and obtaining large wood in the long term.
- Provide sufficient sunlight to the conifers to insure survival and good growth.
- We do not advocate clearcutting to the stream edge. However, research indicates that ten years after clearcutting, vegetation regrowth along Coast Range streams that are less than 10-feet wide will provide shade levels equal to that in mature stands (Summers 1982 cited in Skaugset 1992). This suggests that if a stream side buffer on a small stream turns out to be too narrow to provide maximum protection from solar heating then the impact will at worst last 10-years.

The effect of retention of red alder stands and attainment of Riparian Reserve functions -

- Alder and understory shrub roots maintain streambank stability.
- Little or no durable large wood delivered to the stream or to the riparian forest floor. Small and moderated sized nondurable alder wood delivered to the stream and forest floor with the largest pieces provided between stand age 90 to 130 years (Newton & Cole 1994). No wood delivery after the alder stand completely breaks up. A disturbance would be necessary to reestablish trees on the site.
- The alders provide shade until stand senescence. Stand will start breaking up when it is about 100-years old and will be gone about age 130-years. If present, residual conifers may provide partial shade. Salmonberry may provide full shading over very narrow streams following stand break-up.
- Riparian microclimate is maintained until stand breakup. Stand breakup will create a hard edge resulting in microclimate edge effects reaching into the adjacent stands. Brush competition will maintain the edge conditions by preventing successful regeneration of a replacement stand.
- Understory shrub herbs and shrubs filter sediment.
- Alder stand provides habitat for species associated with hardwoods and disturbed sites. After stand breakup, site provides habitat for species associated with shrubs.

<u>Conversion of red alder stands to conifer and attainment of Riparian Reserve functions</u> -

- A narrow buffer would retain the alder and understory shrub roots that provide streambank stability.
- Depending on site quality and thinning intensity, delivery of large durable wood from 20-inch diameter conifers to the stream and forest floor begins between stand ages of 50 and 90 years. Some nondurable wood delivered to the stream from the alder buffer strip next to the stream. A pulse of alder wood could be placed in the stream and retained for down wood habitat as part of the project design for the conversion project. Conversion will result in forgoing the pulse of wood to the stream and forest floor associated with alder stand senescence.
- Buffer strip would provide shade. If a buffer strip next to a small stream blows down or is inadequate, then recovery of stream shading would be provided by the young conifers in about 10-years. Blowdown into and across the stream would provide dead shade. Very small streams can be fully shaded by salmonberry. The conifer stand can shade a stream for several centuries.
- Riparian microclimate would be recovered when the new conifer stand grows tall enough to block gap below the canopy of adjacent older stands. The time to full microclimate recovery is dependent of the height of to base of the adjacent stand’s canopy.
- Buffer strip filters sediment. The recovery of the herb and shrub layer on Coast Range sites following disturbance is rapid. Sediment delivery is a risk only if site is compacted and gullied.
- Stocking control can put the conifer stand on a trajectory to develop into late-successional habitat.

Potential Timber Harvest Activities
Timber harvest is a component of the Northwest Forest Plan (USDA; USDI 1994). Timber harvest provides local jobs and other economic benefits to local communities, and provides commodities for local, state and national use. We also use timber harvest is as a means to achieve habitat objectives. We will apply several types of cutting practices on BLM lands within the Watershed. The following are descriptions of each method:

Regeneration Harvest: Regeneration harvest on the GFMA lands will be done on sites with stands that have reached or past culmination of mean annual increment. To develop a desired age class distribution across the landscape, regeneration harvest may be applied to stands as young as 60 years. Culmination of mean annual increment on Coos Bay-BLM sites occurs between age 60-years and 80-years, and varies with site quality and stocking levels (USDI 1995 pg 53). Under the current management plan, this type of harvest resembles a light shelterwood or dense seed-tree cut with large streamside buffers. The ROD/RMP sets minimum standards and guidelines for coarse wood, green tree retention, and snag retention on these projects. They are:

- Protect all existing coarse woody debris to the best extent possible. Retain, and if not present, recruit a minimum of 120 lineal feet of decay class 1 and 2 logs per acre with bark intact, and at least 16" through on the large end and 16 feet long.
- Retain all snags that do not pose a safety threat to forest workers.
- Retain 6-8 green trees per acre.

The retention of these habitat elements mitigates for the loss of late-successional habitat by:

- Enabling the new stands to develop into dispersal habitat for late-successional species more rapidly than if we employed a conventional clearcut harvest to the site.
- Providing refuge habitats for some species with limited mobility.

These retained habitat elements also provide habitats for some wildlife species that depend on or benefit from early and mid seral conditions. From a habitat perspective, the scattered green trees, CWD and snags components make the recently cut regeneration units more similar to wild areas that had experienced a moderate to severe fire. This helps maintain those species associated with the early seral conditions that commonly occurred following a fire, but who are less well adapted to exploiting the structurally simpler conventional clearcut unit.

Because of the high stream density on Coos Bay District lands and the width of the Riparian Reserve set by the Forest Plan[4], regeneration harvest units are limited to ridge top and upper slope locations.

Commercial Thinning: Commercial thinning is used to: 1) obtain an early return on management investments in young stands without resorting to a regeneration harvest, 2) salvage recent and anticipated mortality, and to concentrate volume growth on fewer stems (this translates to a larger average log size and a higher stumpage value at time of regeneration harvest). Commonly, commercial thinning prescriptions are designed to provide the optimum growing space for the best formed, fastest growing trees on the site. This can result in obtaining a combined yield from the thinning plus the final harvest that is at least equal to, if not greater than a yield obtainable from a final harvest alone. Usually we best meet our economic and yield objectives by striving for fairly uniform spacing, and leaving the largest trees on the sites. In stands where we expect to do a regeneration cut at age 60-years, we will typically consider commercial thinning when the stand is 30 to 45-years. Stand densities after thinning operations generally range from 100 to 130 trees per acre.

Density Management: Density management is similar to commercial thinning in that a portion of the

[4] 220 feet on perennial non-fish bearing streams and intermittent streams; 440 feet on all fish-bearing streams. The Forest Plan provides for modifying the Riparian Reserve width on intermittent streams, after completing a watershed analysis.

trees are cut in younger stands. The difference is that commercial thinning is designed to obtain an optimum combination of volume yield and economic value over the life of the stand. Density management treatments are designed to assure and/or speed attainment of habitat attributes associated with late-successional forests and riparian forests. Depending on the site and the project objectives, stands as young as 25-years may be treated. The Forest Plan emphasizes density management treatments in younger stands. An REO review and exemption are required before density management can be applied to stands older than 80-years in the LSR. An REO review is not required before applying density management to stands older than 80-years that are in the Riparian Reserve but outside an LSR. However, younger stands generally have a more rapid growth response and develop desired overstory stand characteristics quicker than older stands following thinning. Also young plantations and aerially seeded units, which were regenerated following clearcutting, tend to have less carry over legacy (large snags, older residual trees, large diameter woody debris) than do older stands of natural origin. Since young stands generally respond more rapidly to density management than older stands, and since older stands of natural origin often have some late-successional characteristics, as a result of legacy elements, preferential selection of young stands will result in a more rapid attainment of late-successional characteristics across the landscape for a given amount of effort.

ACS and Land Management Activities

Riparian Reserve widths -

The interim Riparian Reserve widths for South Fork Coos Watershed are based a 220-foot tall site potential tree. We can modify those widths following one of the processes outlined in the Riparian Reserve Evaluation supplement to the Federal Guide for Watershed Analysis (RRTT 1997). This is provided the revised widths allow for meeting or do not retard the attainment of ACS Objectives. A "level 1" analysis, using this watershed analysis, following specified parts of the site-scale analysis in the Riparian Reserve Evaluation supplement, and meeting the requirements for a NEPA site-scale analysis, could support changes in the Riparian Reserve on up to 10% of intermittent stream reserve acres in this Watershed. Riparian Reserve changes up to that scale present few risks to attain watershed scale objectives (RRTT 1997). Larger changes to the Riparian Reserve will require the more comprehensive "level 2" analysis, which is also outlined in the Riparian Reserve Evaluation supplement to the Federal Guide. The ACS Appendix-B and ACS Appendix-C are provided to assist the interdisciplinary teams in completing project scale "level 1" analyses in this Watershed. The ACS Appendix-B provides information on the habitat requirements for the J-2 and selected other late-successional and riparian-dependent wildlife species. The ACS Appendix-C provides information on the habitat requirements for the J-2 and select other late-successional and riparian dependent plant species.

Regeneration Harvest -

Regeneration harvest impacts were analyzed regionally in the NWFP/EIS (USDA; USDI 1994), and district-wide in the Coos Bay District RMP/EIS (USDI 1994, Chapter 4). Regeneration harvest is limited to GFMA and Connectivity lands only. The primary issues that may affect aquatic and riparian systems related to regeneration harvest are: 1) changes to peak and base flows (ACS #6) and 2) increases in slope failure activity (ACS #5). The retention of Riparian Reserves generally prevents measurable or significant changes to components in the remaining ACS objectives.

Issue - Peak and Base Flow Changes

Reiter and Beschta (1995) conducted a literature review and synthesis that looked, in part, at the short term and cumulative affects of timber harvest on stream flows. The following are excepts and summarizations from the hydrology part of their review[5]:

- Clearcutting in the central Coast Range and in the west central Cascades can result in as much as 20 inches of additional annual yield during the first several years following harvest. These increased yields are due to a combination of high average annual rainfall and the high evapotranspiration associated with west coast conifer forests, which means removal of the forest cover results in an increase in water yield. Although annual water yields are predominantly dependent on absolute precipitation amounts, climatic variables including the timing and the form of precipitation, and seasonal evaporation demand can affect the magnitude of water yield increases following harvest. As clearcut watersheds regenerate, evapotranspiration demand increases and water yield decline. In 30 to 40 years after harvest, water yields will return to level associated with mature and old-growth forest.
- Generally the increase in the annual yield from a small watershed is in proportion to the portion of the watershed harvested. For example, where 20 additional inches of water yield might be expected if 100% of a small watershed is harvested, then 10 inches of additional yield is expected when 50% of the small watershed is cut. After reviewing more than 90 watershed studies, Bosch and Hewlett (1982) concluded that water yield increases are usually only detected after at least 20% to 30% of a conifer forested watershed has been harvested.

- In the Oregon Coast Range, peak flows are predominantly generated by rainfall events. Following timber harvest, peak flows during fall and spring periods are likely to be increased primarily due to reductions in transpiration and interception losses following harvest (Jackson and Van Haveren 1984 cited in Reiter and Beschta 1995). However, fall and spring peak flows are generally considerably smaller than the larger peak flows that typically occur during large storms in midwinter.

- Any water yield increases from small watersheds following denuding, even though quite large on-site, become increasingly difficult to detect downstream because of normal fluctuation in flows from groundwater sources, tributaries, or the patterns of precipitation or snow melt across the basin, which contribute to the natural background variability in water yields. Thus the changes in water yield attributable to timber harvest may be statistically undetectable because the amount of that change is less than a single standard deviation of the natural background fluctuations.

- When large basins experience harvesting distributed over relatively long periods, there appears to be little measurable effect at the mouth of the basin. However, if large forested portions within a basin are removed at one time, there may be more of a measurable effect. For the Wilson River in the northern part of the Coast Range, a large percentage of the basin burned from 1933 to 1951. When the annual water yields from the 1930s to the 1990s were inspected, no apparent trend in annual yields were observed. However, when seasonal water yields were considered, decreasing trends for the post-1950 period appear to have occurred for spring and fall months. In general, for the Coast Range in Oregon water yields would be expected to show the most increase in the fall and spring when transpiration differences between fire-burned and forest areas are generally greatest.

- Much of the research on the affects of timber harvest on water yield was done by studying the affects of harvesting entire small watersheds and involved treatments that went from ridge top to creek edge. Little research has been done in the Pacific Northwest looking at the affects of partial cuts, thinnings, patch cuts or the affect of clearcutting while retaining streamside buffers on water yields. However, an average annual yield increase of 2.4 inches was detected for four years after a shelterwood cut in a

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[5] Reiter and Beschta, and the researchers they cite, do not use the hydrologic unit terms like watershed, subwatershed drainage or basin in a consistent manner with respect to relative ranking or absolute sizes of the hydrologic units. Therefore the term "watershed" as used in the literature cited in this subsection of the watershed analysis does not equate to "watershed" as defined for watershed analysis purposes. The same is true for the other hydrologic unit terms.

southwest Oregon Cascades watershed, where 50% of the basal area was removed and road right-of-way occupied 8% of the watershed. A patchcut watershed, which had 20 small clearcuts and road right-of-way occupying 38% of the watershed resulted in an average water yield increase of 3.5 inches (Harr et al. 1979). Where individual trees or small groups of trees are harvested, the remaining trees will generally use any increased soil moisture that becomes available following timber harvest. Because of such “edge effects”, partial cuts, light shelterwood cuts, and thinnings are expected to have little influence, if any, on annual water yields.

Trees in the Riparian Reserve intercept, take-up, and transpire the water in the soil made available by up slope harvest activities in the Matrix. Chen (1991), in his study of edge effects on microclimate patterns, found that edge effect, with respect to soil moisture, was not detectable at distances greater than 197 to 295 feet (distance depended on aspects) into the stand from the stand’s edge against a recent clearcut. This suggests the hydrologic response of a landscape, where Riparian Reserves are employed, may be very different from the response of watersheds that are denuded from ridge top to creek as part of research projects. In one hydrologic study where a stream buffer was employed along the main channel, nearly 25% of a 750-acre watershed was clearcut. The clearcut area was divided into three harvest units, each averaging 62 acres. No changes peak flows were observed, even during fall and spring storms (Hall *et al.* 1987).

Based on their literature review, Reiter and Beschta (1995) came to the following conclusions on the affects of management on stream flows:

- Small watershed studies have shown that clearcut harvesting can increase water yields (for tens of years) and low flows (for several years). Even so, the affect of forest harvesting on water yields and low flows of large basins is likely to be generally indistinguishable from natural flow variations without some statistical control. Although long-term trends of increasing water yield have been observed (e.g., the Grand Ronde in northeastern Oregon), the causes of such trends are not clear and their relationship to forest management practices indeterminate. Small watershed studies most commonly indicated magnitudes of peak flows following harvesting, although variable responses, including decreases and no changes, have also been reported. It would appear that increases in peak flows derived from the harvesting of small watersheds are not a major contributor to peak flow magnitudes associated with larger basins. However this topic has not been adequately addressed.

- Increases in peak flows, of and by themselves, are unlikely to change channel morphology without additional changes in sediment input, reductions in channel roughness, or decreases in bank stability. The magnitude of channel change is highly dependent on basin morphology and hill slope inputs.

- Some cumulative effects methodologies use timber harvest levels as a surrogate for impacts, e.g., limiting timber harvest to a certain percent of the basin per year to keep average sediment levels below a set level. This relatively simplistic approach does not account for regional variability, harvest location, yarding system, roading, etc., and assume a direct causal mechanism between timber harvest and the magnitude of impact. In most cases, it is not the fact that trees were harvested, but how they were harvested, where on the landscape, the methods of roading and yarding, the degree of riparian protection, and other factors that ultimately determine the impact of a forest practice operation.

Currently, stands younger than 30-years old occupy 32% of the federal lands in the South Fork Coos Watershed. In 20 years, 10% of the federal lands will support stands that are 30-years old and younger. This assumes all the federal stands older than 60 years in the Matrix are cut during that 20-year period. As the percent of BLM lands, occupied by stands younger than 30-years old, decreases to less than 30%, the effect of regeneration harvest on the hydrology of BLM lands will no longer register as a detectable change in streamflows. Additionally, Riparian and Late-Successional Reserves make up about 90% of the BLM land in this Watershed. Currently 66% of these acres support stands that are older than 30-years. This will approach 100% by 2024. By that time the only stands younger than 30-years on the LSR and Riparian Reserve lands will be sites regenerated following natural disturbance or as a result of brush field and alder conversions. Therefore, sometime before 2018, forest management activities on BLM lands will no longer measurably contribute to increases in peak or base flows in this Watershed.

The preceding analysis of timber harvest and hydrologic recovery on BLM land is a simplistic approach. The analysis does not and cannot take into account the moderating affects of the stream buffers left on 3rd order and larger streams since the early 1970's nor the moderating affects of the Riparian Reserves. While it is theoretically possible that all Matrix stands older that 60-years could be cut, administrative withdraws to protect fragile sites, project scale identified survey and manage species buffers, the likelihood of finding additional marbled murrelet sites that will need protected core areas argues otherwise. Nor does the analysis reflect the observation that harvest affects, which may be statistically observable at the site scale, are often statistically indistinguishable from the normal range of natural variation at the 5th field watershed scale. The analysis may be best interpreted to say that assuming the most pessimistic scenario, we will attain hydrologic recovery on most all the sites on BLM land sometime before 2018. However, taking the available literature in consideration, changes in present and future flows associated with past and projected timber harvest on BLM land may be difficult to observe or if observed may be difficult to statistically validate. Given the protective measures provided by the Forest Plan, the restoration and maintenance of Riparian Reserve functions with respect to large wood and coarse sediment recruitment potential, and streambank stability will have much more observable affect on watershed recovery.

Issue - Slope Failures

Regeneration harvest may increase slope failure rates on steep slide prone slopes. The mechanism behind this is the loss of root strength between when the cut trees' roots die and decay, and new tree roots recolonize the soil. However, soils, geology, slope gradient and the occurrence and intensity of storms events also influence slope failure rates. The highest risk areas occur in headwalls and on steep slopes with thin extremely fragile soils. All headwalls and most other sites of the extremely fragile soils are incorporated into the Riparian Reserve network and the LSRs. The remaining sites with extremely fragile soils on Matrix land have a TPC classification of FGNW and are administratively withdrawn from the timber base. As a result, a continuous forest cover is maintained, to the extent practical, on those sites. Thus a tree cover and down wood are retained on this sites until a slope failure transports those components to the riparian zones and streams where they take on new structural and habitat roles. With 65% of BLM lands in the interim Riparian Reserve land use classification, the maintenance of the sediment regime should continue at a rate within the natural range of variability. The interim Riparian Reserves provide a 220 to 440-foot wide buffer between regeneration harvest units and the nearest stream channels and headwalls. This buffer will intercept slides that may begin in the Matrix.

ACS Summary

Over time, 10% of BLM lands would be available for regeneration harvest. This percent will be further reduced by TPCC withdraws from the timber base, and protection buffers around the known sites of some S&M and T&E species. No regeneration harvest would occur in the Riparian Reserves except hardwood conversions done to restore Riparian Reserve function. These reserves protect the streams and riparian processes from the affect of activities on the upland areas. Riparian and Late-Successional Reserves (90% of BLM lands and 18% of the Watershed) would maintain the components necessary to meet all ACS objectives over time on BLM lands. Following the Standards and Guidelines (USDA; USDI 1994) on Matrix lands would not retard or prevent attainment of ACS objectives in the Watershed.

Commercial Thinning/ Density Management -
Thinning/density management reduces stocking levels. This increases the available growing space, and thus increases the growth rates, for the residual trees. Stands receiving density management treatments will provide larger diameter trees and snags to the riparian area, and larger diameter CWD to both the aquatic and riparian systems in a shorter time than will untreated stands (see Table ACS-9).

Table ACS-9: Stand Age When 20 Inch Diameter Live and Dead Trees Are Attained
(From the Density Management and Conversion Treatments and Attaining Riparian Reserve Function section)

	PCTed stand with no subsequent density management treatment	PCTed stand receiving a density management treatment at age 40 leaving 120 trees/ acre	PCTed stand receiving a density management treatment at age 40 leaving 60 trees/ acre
Stand age when the average newly dead tree has a dbh $\geq$20 inches:	120 to 180 years	80 to 90 years	50 to 60 years
Stand age when the average live tree has a dbh $\geq$20 inches:	70 to 110 years	60 to 70 years	50 to 60 years

Shortening the time taken by a stand to produce large diameter wood, which is recruitable to the stream channel and riparian areas, will speed restoration of terrestrial habitat components and provide instream CWD sooner. Earlier recruitment of large instream CWD is needed because large wood can store sediments, and trap gravel deposits. Large CWD can modify the stream hydrology in ways favoring formation of deep pools, backwaters and off-channel habitats. These benefits are accrued both next to the treated stand and downstream. Thinning also increases the light level reaching the forest floor. The increased light allows understory herbs, shrubs and trees to establish and grow, which in turn results in greater live structural diversity. This would benefit many riparian species dependent on multilayered forest habitats over time. Desired effects obtainable by using density management include maintenance of habitat connectivity (ACS #2), species composition and structural diversity of plant communities (ACS #8) and habitat to support well-distributed populations of riparian-dependent species (ACS #9).

Issues - Habitat Connectivity/ Structural Diversity/ Riparian Habitat
Thinning reduces suppression mortality, which reduces the recruitment rate of small CWD and snags in the short term. Thinning would also allow more light to reach the forest floor. This can be viewed both as a negative effect or a positive effect depending on which habitat attribute is considered. Increased sunlight could cause a short term undesired drying of habitats used by moisture dependent species. However, increased sunlight would also allow for the reestablishment of the herb and shrub layers where they are currently inhibited due to the lack of light penetration. In the near term, forgoing density management favors species and habitats associated with mid seral stand conditions. In the long term, density management favors species and habitats associated with late-successional forest conditions.

Density management affects on temperature and humidity levels last only until canopy closure occurs. Widely spaced thinnings can result in a rapid recruitment of an understory stand, early attainment of complex deeply fissured bark, and development of deep canopies. Wide spacing would also affect the in-stand temperatures and humidity more than a conservative thinning. Thinnings would have little to no effect on the stream flows as the residual trees would use any increased soil moisture that becomes available following harvest.

Short term impacts from density management would be avoided in unthinned riparian areas, and by incorporating no-cut buffers along streams and no thin patches in density management projects. Thinned and unthinned areas would provide a variety of habitat connectivity levels within and between watersheds. Unthinned areas would provide continual input of snags and down wood of a smaller size in the short and long term. Additional benefits from unthinned areas would include shade retention along streams. Shade maintains cool and stable temperatures throughout the year. Stream side vegetation maintains the physical integrity of stream banks.

Recent research is forcing new discussions on what are appropriate stocking levels for areas managed to attain late-successional characteristics. Tappeiner *et al.* (1997) observed that old-growth trees in the Coast Range exhibited a very rapid rate of growth as young trees. Those trees often averaged 20 inch DBH at age 50 and 40 inches at age 100. By running stand development simulations, Tappeiner *et al.* found stocking levels of 31 to 46 trees per acre at age 20-years resulted in the better fit to observations made in old-growth stands with respect to total densities of the larger diameter classes. This suggests that plantations stocked to levels consistent with maximizing volume or economic value on a 40 or 60-year rotation are unlikely to develop characteristics typical for Coast Range old-growth without either active management or a disturbance. Based on Tappeiner's study, our own observations on old-growth diameter growth rates in this Watershed, and on stand modeling, we would need to reduce stocking levels below 80 trees per acre on the first density management entry if we are to redirect the stand development trajectory to become in line with that followed by the old-growth in this Watershed. Fully attaining ACS objectives #2, #8, and #9 may require us to manage some stands for stocking levels below 80-trees per acre.

ACS Summary
Based on current knowledge and recent experience, density management prescriptions that include thinned and unthinned patches across the landscape would provide habitat complexity, and allow for retention of those desirable elements currently present on the project site while putting the stand on a path toward late-successional stand development. The levels of both beneficial and detrimental impacts associated with thinning are correlated with the post-treatment stand density, how creative the ID team was at managing for various habitat characteristics, and where they apply a particular treatment in the Watershed. Attaining all the ACS objectives will require following the Best Management Practices and managing for a range of stocking levels across the landscape. This range goes from the low densities consistent with attaining old-growth characteristics to high stocking densities, found in no-cut areas and/or lightly thinned areas, that preserve the high humidity and full shade levels desired for attaining other ACS objectives.

<u>Hardwood/ Brushfield Conversion</u>
The expected impacts of hardwood/ brushfield conversions in the Watershed are minimal as there are potentially less than 1,000 treatable acres. We use a conversion treatment to reestablish conifers in a hardwood/shrub dominated unit where original planting efforts have failed.

Issue - Water Quality/Quantity Changes
The potential concerns associated with hardwood conversions are stream bank stability and shading as affected by the removal of vegetation near live streams.

ACS Summary
The time small streams, which are less than 10-feet wide, will be exposed to sunlight is less than 10 years. Research shows that following denuding beside a small stream, new stream side regrowth will provide shade levels equal to that provided by a mature stand in 10 years (Summers 1982 cited in Skaugset 1992). We can shorten this time by leaving buffer strips. Stream side no-treatment areas with widths equal to half the crown diameter of the trees on the site will maintain live root strength provide stream bank stability (FEMAT 1993). Hardwood and brushfield conversion projects are the vehicles for reestablishing conifer and mixed stands, which in the long term, would contribute large durable CWD to the streams and eventually develop into late-successional habitat. Conversion projects will not retard

attainment of ACS objectives.

Salvage Operations -
Post-catastrophic event salvage is expected to be limited in the Watershed as the weather conditions rarely provide the combination of large rain events and unusually strong wind patterns necessary to create a large blowdown area. Individual tree and small patch blowdown do occur during typical winter storms. Given current access and fire suppression efforts, large fires are rare and small fires are rapidly controlled.

Catastrophic Salvage in Riparian Reserves/ LSRs
The South Coast - Northern Klamath Late-Successional Reserve Assessment (USDI; USDA 1998) contains the recommendations for dealing with salvage in the LSR portion of the Watershed. Salvage may only take place in disturbed sites greater than 10 acres that have a canopy closure less than 40%. All green trees likely to survive, should be retained. Following salvage operations, at least 24 snags per acre of the largest diameter will be retained. Requirements for down wood retention are to be based on plant community, seral stage, site conditions, risk of future disturbances and other factors (USDI; USDA 1998 pg. 72-73). Coarse woody debris retention guidelines for Coast Range sites are as follows (USDI; USDA 1998, pg.90):

- First site potential tree height – 3,600 - 9,400 cubic feet/ acre
- Second site potential tree height – 1,600 - 2,300 cubic feet/ acre

The data used to develop the recommendations for salvage following a catastrophic disturbance in the LSR is also applicable to the Riparian Reserves that are outside the LSR. Therefore, we recommend following the LSR assessment guidelines for post-catastrophic event salvage should the need arise in the Riparian Reserves outside the LSR.

Roadside Salvage in Riparian Reserves
Thirty-six percent of BLM road miles in this Watershed are in Riparian Reserves. Past salvage operations outside the road prisms but inside what is now the Riparian Reserve have resulted in the loss of certain habitat components associated with several ACS objectives. Those ACS objectives for structural diversity, habitat complexity, nutrient cycling, large wood recruitment and subsequent instream and riparian habitat development are the most affected. To prevent the further loss of these components, salvage outside road prisms is not recommended except in those cases where reduction of the size large accumulations of wood is necessary to protect the Riparian Reserve from greater injury by fire, insects or other damaging agents.

ACS Summary
The Coos Bay District RMP/ROD allows salvage inside the Riparian Reserve only if it is required to attain ACS objectives, and if present and future woody debris needs are met (USDI 1995). The Best Management Practices section provides additional guidance that states “Naturally-occurring down logs or trees will not be removed from the Riparian Reserves except for the benefit of the stream or Riparian Reserve. Potentially floatable debris that may be mobilized during infrequent high floods and may reasonably damage downstream users’ improvements may be removed after watershed analysis” (USDI 1995 pg D-2). Given this context, salvage activities may be justified to the extent needed to obtain sufficient planting spaces for rapid reforestation, and to reduce hazards created by catastrophic events that may further threaten the function of the Riparian Reserve. For example following a fire, we may need to use a salvage operation to create a fuel break between remnant green patches of trees and down slope heavy fuel concentrations so to reduce the risk that a reburn might destroy those patches. Salvage logging may be needed to prevent a bark beetle epidemic and allow access to the ground for reforestation following an extensive blowdown event across the landscape. The recommended snag and down wood

retention levels are based on observations and measurements made in natural stands. They are designed to provide for large wood structure in the replacing stand while reducing the risk of additional green tree and structural losses due to reburns and insects. The recommended snag and down wood retention levels still represent a sizable fuel load. Consequently for salvage to be effective at protecting the function of the Riparian Reserve, the treatment should be designed to break up fuel continuity and not just reduce the volume of fuel on the site. The retention levels would also result in increases in bark beetle populations on shady sites but not on sunny sites (Smyth 1959). Post catastrophic event salvaging will not necessarily prevent the loss of additional green trees to bark beetles, but would reduce the numbers of green trees lost compared with the no treatment alternative[6]. Retention of fire charred trees, and some charred snags and down wood would benefit those wildlife species[7] that consume insects that specialize in colonizing fire injured or killed trees (Murphy; Lehnhaysen 1998).

Fertilization -
Fertilization increases growth on existing trees, which accelerates the development of habitat characteristics associated with large diameter trees. Stands are usually aerially fertilized using a helicopter.

Issue - Water Quality
Impacts from fertilization could include the direct input of fertilizer into the stream and a subsequent increase in nitrogen to the stream system.

ACS Summary
Mitigation measures include no fertilization buffers of at least 100 feet wide along all flowing streams that have domestic use, support fisheries, or have other important uses (USDI 1995: Appendix D). Streams used for domestic water sources, hatcheries or municipal water supplies are monitored to ensure the effectiveness of the buffers. In general, any fertilizer introduced to streams is quickly diluted or taken up by aquatic and riparian vegetation. Fertilizing forested stands would not prevent the attainment of ACS objectives.

Road/Landing Construction -
New road construction would be minimal in this Watershed as ridge top roads already provide access to many future harvest areas.

Issue -Water quality
Historically, road surface erosion was a source of fine sediment, and poorly located and poorly engineered roads, by today’s standards, were the trigger points for debris avalanches/ torrents. Not all roads are a problem. Roads that are not connected to streams will not contribute sediment to the stream system. Roads on stable ridge top and upper slope locations or on stable benches will not cause landslides that will reach streams.

ACS Summary
Through compliance with ROD/RMP standards and guidelines for road management, and the Best Management Practices (USDI 1995: pg. C-32, C-33; Appendix D), road construction and reconstruction would not prevent the attainment of the ACS objectives. Impacts from soil displacement and compaction

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[6] The Vegetation and Disturbance Processes Appendix includes an the epidemiology of the Douglas-fir bark beetle.

[7] The black backs characteristic of many woodpecker species may be an adaptation that allows those species to be less conspicuous when they are foraging on the charred surfaces of burned trees, snags and down wood.

would be minimized and would be consistent with the effects analyzed in the RMP/EIS (USDI 1994: Chapter 4, pg.15-21).

New roads will be built on stable locations as much as possible (e.g., ridge tops, stable benches or flats, and gentle-to-moderate side slopes). Grades will be rolled (varied) to maintain stable locations. Headwalls, old slump benches, seeps and side slopes greater than 65% will be avoided as much as possible. Heights of cut banks will be minimized and balanced earthwork will be used (USDI 1995, Appendix D-3).

For the Tioga Creek Key Watershed, when constructing new roads, an equal amount of road miles must be decommissioned (culvert removal, sub-soiling and a permanent barrier) (USDA; USDI 1995: pg. B-19). If funds are insufficient to close roads, no construction would occur (USDI 1995: pg. 70). Road closures with gates or barriers do not qualify as decommissioning or a reduction in road mileage (USDA; USDI 1994: pg. B-19). Although temporarily barricading does not count toward meeting the road milage reduction objectives for key watersheds, the elimination of vehicle traffic does reduce sediment delivery associated with road surface erosion (Foltz 1996; USDI 1997: Table EROD-3) for the time the barricades are in place.

Gates and barriers also reduce mortality and harassment of terrestrial wildlife species. The Coos Bay District has pursued road closures since 1994. Most roads selected for closure are on ridge top locations, which we closed using barriers. Ridge top roads typically do not cross draws or have ditch lines that empty water directly into stream channels. Therefore, they are not connected to the stream network and thus do not contribute to increases in peak or base flow or the stream network. These roads, normally being separated from streams, also did not prevent the attainment of in-channel CWD and substrate, nor contribute fine sediments to streams. Once blocked, these roads would eventually become, overgrown with vegetation. Typically the road segments blocked by windthrows or debris were already overgrown when officially closed. The barricading ridge top roads does not prevent or retard the attainment of ACS objectives.

We can use the following treatments to close roads depending upon site conditions and needs identified through an interdisciplinary team review:

- Block the road with a permanent barrier leaving all improvements in place
- Decommissioning - block road, pull culverts and fill to restore natural drainage pattern
- Full decommissioning - block the road, pull culverts and fill to restore the natural drainage patterns, and subsoil road surface.

The treatment would depend on the road location, surface type, presence or absence of vegetation on the road surface, and the impacts to the drainage network and large material movement. All closed roads would be left in an erosion resistant state.

Most BLM stream side roads are paved. Paving all but eliminates sediment delivery from road surface erosion (USDI 1997).

<u>Road Maintenance</u> -

Hazard Tree Removal

Hazard tree removal (usually conifers) along BLM roads occurs infrequently and is necessary to provide safe driving conditions for the public. The ROD/RMP allows for the removal of these hazard trees (USDI 1995: pg.70). The ROD/RMP also recommends leaving trees on the site when CWD amounts are inadequate or the topping of trees as an alternative. In Riparian Reserves, retention would help to attain ACS objectives (see the Salvage Operations subsection above) over the long term.

Roadside Alder Removal
Roadside alder removal is often necessary to provide for safe travel on BLM paved roads. Decomposing alder leaves build up on road surfaces and create hazardous (slick) driving conditions. Removing alders that overhang paved roads reduces this hazard by decreasing the buildup of leaf litter on the running surface, and increases solar heating of the road, which helps dry the running surface. Roadside red alder removal also improves safety by increasing sight distance on some curves.

We have paved most BLM stream bottom roads within the Watershed. Impacts related to the removal of these overhanging trees are generally associated with the potential increase in stream or riparian area temperatures and these impacts are largely confined to those road segments that closely parallel streams. Impacts to the structural diversity and habitat connectivity are generally limited because only alders growing inside the road prism are removed. Removing red alders can have an incidental benefit of releasing nearby conifers.

The ability of a streamside forest to provide shade varies with topography, channel orientation, size and number of canopy openings above the channel, angular canopy density, and the presence and density of understory trees and shrubs.

Road maintenance, streamside shade and water temperature
Brazier and Brown (1973) found angular canopy density correlated well with stream temperature control. The angular canopy density is measured for the solar angle during the minimum flow period. For streams in their study, the maximum angular canopy density (maximum shading ability) was reached within an 80-foot width, with 90% of maximum reached in within 55-feet. Brazier and Brown observed the efficiency of heat blocking increased rapidly with increasing buffer strip width, up to 30-feet, before leveling off at a maximum, at around 40-feet.

On Coast Range sites, where no buffers were left following logging, riparian vegetation regrowth along small streams (about 10 feet wide) will provide shade levels equivalent to mature stands in 10 years (Summers 1982 cited in Skaugset 1992). Another study showed 50% of a Coast Range stream shaded within 5 years of harvesting and burning (Beschta *et al.* 1987).

Water temperatures, increased by solar heating along exposed stream reaches, are unlikely to decrease as when the stream passes through shaded downstream reaches. If stream temperature reduction occurs, it is probably the result of mixing with cool water from a tributary stream or from subsurface seepage into the stream (Beschta *et al.* 1987.).

Riparian shade is unlikely to have a significant influence on stream temperature where the natural low flow stream width exceeds 100-feet (Washington Forest Practices Board 1992).

ACS Summary
The literature cited above suggests removing roadside trees will not prevent attainment of ACS objectives under the following conditions:

- Roadside hazard tree and road side alder removal occurring more than 40-feet from streams are unlikely to influence solar heating of the water provided there is a functioning stand of trees occupying the area within 40-feet of the streams.
- Streams 10-feet wide and less, with stream banks more than 10-feet from the lower edge of the road prism, will be adequately shaded if we retain at least a 10-foot wide untreated buffer. These streams include functioning first order streams, and functioning geologically confined second and third order streams (most second order streams and some third order streams in this Watershed).
- The low flow width of South Fork Coos River is greater than 100-feet wide. Therefore, removal of

vegetation within the road prism of roads next to the South Fork Coos River is unlikely to influence water temperature.

Streams at risk of thermal increase, as a result of roadside hazard tree and road side alder removal, are:
- Those streams that are less than 10-feet wide that are within 10-feet of the toe of the road prism.
- Those streams that are between 10-feet and 100-feet wide, which are within 40-feet of a road prism.

The lineal feet of stream, inside this Watershed, at risk for water temperature increase resulting from removing unwanted trees within the road prism is unknown. However, visual inspection of road maps shows few BLM controlled roads are within 100-feet of streams.

Oregon Forest Practices Act guidelines allow no less than a 10-foot buffer. Therefore, treatment within 10-feet of a stream is unlikely except where there is a risk to human life. Individual hazard tree removal is unlikely to have an impact that is outside the natural range of variability if the cut tree is retained as down wood within the Riparian Reserve or added to the stream. Removing alders from the road prism can have an incidental benefit of releasing conifers or understory shrubs next to the road prism. Growth of released conifers will provide a long term benefit with respect to attainment of shade and large wood debris recruitment potential. Trees are individually selected and marked for cutting based on a tree by tree consideration of potential affect on stream temperature, stream and bank stability. By removing only those trees that have the most of their canopies overhanging the road (>50%), impacts would be further reduced. No-cut buffers and selective removal would help to reduce potential impacts to riparian/aquatic temperature increases. Following these guidelines should not prevent the attainment of ACS objectives over time.

<u>Other Road Maintenance Activities</u>

Brushing, Ditch-cleaning and Grading

Brushing, ditch-cleaning, and grading would not prevent the attainment of ACS objectives as they are restricted to the road prism. Ditch line cleaning exposes bare soil and by that produces short term increase risk of surface erosion. As vegetation reestablishes in the ditches, usually within several months, the erosion risk decreases. Soil erodibility is directly related to the soil texture. Coarse and fine soil particles are less susceptible to erosion than intermediate textured particles. Most of the sediment produced by ditch-cleaning activities travels only a short distance before the forest vegetation and duff filters it. Table ACS-10 summarizes ditch cleaning activities based on road maintenance level. The 1996 USDI-BLM Transportation Management Plan contains additional information on the maintenance levels.

Table ACS-10. Road Maintenance Levels and Their Ditch-cleaning Frequency

Maintenance Level	Ditch-Cleaning Frequency
1	No ditch cleaning
2	3 - year cycle
3	annually
4	annually
5	annually

Small Culvert Replacement

Undersized, improperly aligned or failing culverts could affect habitat connectivity, physical integrity of stream banks and bottoms, water quality and the transport of material. Under the Forest Plan, we will size new and replacement culverts to pass a 100-year flood event flow, and align the culverts with the channel. Short term impacts could include slight increases in turbidity for a short period after the first rain of the season. All culverts should receive routine maintenance. Following these procedures would help to attain ACS objectives in the short and long term.

Sidecasting Slide Material
Storm events and road cut design can cause soil sloughing along roads. Where road cuts exceed the soil's angle of repose, sloughing can occur. These events are small. However, they usually contain a high percent of fine material, which can become sediment if scooped up and indiscriminately sidecasted off the road near a stream. Following the management direction for roads inside the Riparian Reserves (USDI 1995: pg. 69) avoids this and other practices that could introduce sediments into streams. Following these guidelines would not prevent the attainment of ACS objectives.

Both natural processes and management activities cause in-channel debris avalanches and torrents. Initiation generally occurs in headwall areas, and the slides can travel downstream for long distances. These slides can transport large amounts of coarse and fine sediments, and depending on management history, can also transport CWD. As the slide progresses downstream, the larger sized sediments (gravel, cobble, boulders) drop out and accumulate in the stream channel where stream gradients decline. Due to their small size, fine sediments are transported much farther downstream and only settle out in flat gradients reaches and in pool areas.

Many streams within the Watershed are deficient in substrate. These streams depend heavily on debris slides and torrents for the recruitment of in stream material to provide for hydrologic roughness and aquatic habitat components. Currently, roads intercept many landslides. The roads act as benches that slow or completely stop the slides preventing them from delivering much needed coarse substrate and wood to the streams. Oregon state guidelines do not allow the transfer of the landslide debris over the road prism and back into the channel. Therefore, this material is end-hauled offsite thus eliminating a critical natural recruitment process. We recommend depositing this debris in the channel during high flows so the stream can sort and distribute the material. Further discussions with responsible state agencies have begun to alleviate this disparity. Not allowing this activity retards the attainment of the ACS objective related to the sediment regime (#5).

<u>Site Preparation</u> -
We use controlled fire to prepare most regeneration units for planting and to reduce the risk of wildfires. We may, in the future, prescribe under-burning in density management units to promote the regeneration of an understory stand. Other site preparation methods include hand or machine pile burning, concentration burning and landing pile burning.

The primary benefit of site preparation is increased probability of conifer establishment. Site prep accomplishes this by increasing plantability, reducing vegetation competition, reducing the risk of mountain beaver caused mortality and releasing nutrients back to the soil making them available for the tree seedlings. Impacts vary with burn intensity. They include the charring of existing snags and down wood, altering their suitability as habitats for some species. Hot burns can reduce soil nutrients and increase surface erosion potential. They can also recruit new snags, which in turn, will provide new CWD in the future.

Activities that reduce the adverse impacts of burning include:
- building fire breaks to protect fire sensitive resources,
- burning when there are spring-like conditions or during the winter months to decrease the severity of the treatment,
- pullback of materials from snags/CWD to minimize consumption,
- and wet-line boundaries where fuel concentrations exist.

We prescribe "cool burns" timed to coincide with moist soil and duff conditions. Well-timed cool burns preserve the duff layer, avoid consumption of wood larger than 3 inches in diameter, and avoid volatilizing nitrogen.

The interim Riparian Reserves are a 220 to 440-foot wide "buffers" between Matrix regeneration units and streams. Therefore, site preparation on Matrix land does not retard or prevent the attainment of ACS objectives. Site preparation on hardwood and brushfield conversion projects inside the Riparian Reserves will allow for long term attainment of the ACS objectives that are contingent on attaining large diameter conifer trees and CWD, or attaining a conifer component in the riparian stands.

Non-Forestry Related Activities

Restoration Activities -

In stream restoration opportunities are limited on BLM lands in the Watershed as we have already treated most of the potential instream and riparian sites. We completed assigning maintenance levels and identifying potential road closures through the TMO process in 1998. We need to complete field review of several roads proposed for closure to assess the needs for potential culvert removal, evaluate the proposed road closures thorough the NEPA process and obtain funding for each road closure project. Except where we build new roads to access timber sale units, we have few opportunities for additional road closures. Most all the new BLM road construction will be on ridge tops outside the Riparian Reserves. Most existing roads access private land in addition to BLM land. Right-of-way agreements with private land owners that use these roads predate the Forest Plan and BLM's ability to act unilaterally. In some cases, closing BLM roads without considering private landowner access needs would force private landowners to build replacement roads in less stable locations, which defeats the purpose of closing roads to attain ACS objectives.

We have slated several large culverts on Hog Ranch, Shotgun and Cox Creeks for replacement. The Coos Watershed Association is pursuing restoration opportunities on private lands.

Recreation Activities -

BLM has no developed recreation sites in the Watershed. We do have primitive camp sites throughout the area. Since most people camping on BLM land in the Watershed drive campers or pull trailers, the repeatedly used primitive camp sites commonly have a gravel surface. Typically the primitive camp sites are in quarries, wide pullouts, on old landings and on short spurs. Several are next to Tioga Creek. People use these sites primarily in the summer, during long holiday weekends, and in hunting season. Often these sites show signs of use: small openings, stacks of firewood, fire rings, some tree wounding, and compacted soils.

The RMP/ROD proposes a 30-acre camp ground on Tioga Creek (USDI 1995, pg.48). Part of the site is already used as a primitive camp site and received an estimated 100 visits in 1990 (USDI 1992: pg. 3-73). The primitive camp site is on the flood plain of Tioga Creek. In 1996, a 50-year flood event inundated the entire area.

ACS Summary

The impact caused by the primitive camp sites inside the Riparian Reserves, with respect to sediment delivery is likely minor. When considered in the context of the normal range of variability for naturally occurring sediment delivery, the impact of the existing primitive camp sites on the Watershed is undetectable. Within the context of the entire Watershed, habitat loss and affects to ACS are minimal.

Developing the proposed Tioga Creek Recreation Site on the flood plain would prevent the attainment of ACS objectives at the site scale as riparian trees and other vegetation would be removed for construction, maintenance and safety purposes. This would reduce riparian habitat availability, connectivity, diversity and potentially increase stream temperature if large amounts of vegetation were removed. The potential for chemical and fecal coliform pollution would also increase in proportion to campground use. If the BLM builds a recreation site in this area, the watershed team recommends locating it outside the flood plain. This recommendation is both to attain ACS objectives at the site scale and to avoid investing in improvements where they are at risk of flood damage.

The RMP/ROD also designates a new “Tioga Basin Special Recreation Management Area”(SRMA), which will require a written plan. The SRMA designation covers the area inside the Tioga Subwatershed and parts of the East Fork Coquille Watershed. This designation is in recognition of growing recreational use in this area. If we construct recreation facilities in Riparian Reserves, they would be designed so as not to prevent meeting the ACS objectives, and we would document this through the NEPA process.

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